MWSUG 2016 - Paper PO09

What to Expect When You Need to Make a Data Delivery. . . Helpful Tips and Techniques

Tom McCall, Abt Associates Inc., Bethesda, MD

Louise S. Hadden, Abt Associates Inc., Cambridge, MA

ABSTRACT

Making a data delivery to a client is a complicated endeavor. There are many aspects that must be carefully considered and planned for: de-identification, public use versus restricted access, documentation, ancillary files such as programs, formats, and so on, and methods of data transfer, among others. This paper provides a blueprint for planning and executing your data delivery.

INTRODUCTION

Congratulations! You're expected to make a data delivery. This paper and poster will walk you through the questions you should ask, the resources you should check, the resources you should create, and the SAS® tools that will help you along the way. In essence, we'll travel back to the future to find out exactly what you need to be doing from the very start of your project, so you don't run "outtatime".

QUESTIONS YOU SHOULD ASK ABOUT THE PROJECT AND ITS DATA

- Is there any information regarding data processing in the proposal / contract / grant application / Statement of Work (SOW) – or the request for proposal (RFP)?
- Is there a data usage agreement (DUA) / Data Security Plan (DSP) / Data Management Plan (DMP) / Analysis Plan (AP) in place for the project that would give you information as to the source of the incoming data, the security level of the incoming data, where the data is housed, the timing of the incoming data (waves, years, quarters, months, etc.), and/or any analytic activities planned for incoming data?
- Is there any information on the source of the data? i.e. is the data coming from a survey, web or otherwise? Claims data bases? Collected from public use files on the web? Are you creating the data? If so, how?
- Is there any documentation for the incoming data (we assume you will use SAS tools to document any data you create!)? Any usage notes that might be relevant?
- How is the data structured? Is it in the same structure as required in the data delivery?
- What type of data elements are in the incoming data? Do they include IDs, binaries, categorical, continuous, or character?
- Is there directly or indirectly identifiable information included in the data? (Indirectly identifiable information can be ambiguous)
- Is there any data collected from study participants? If so, what does their informed consent form say about data confidentiality?
- Are there any relevant company / government / prime contractor regulations that apply to the use of incoming and/or created data, i.e. HIPAA, FISMA, FDA, etc.?
- Is your incoming / created data subject to IRB regulations?
- Is there a data manager / data lead for the project (is it you?)

- Who else is working on the project? Anyone else with data processing and analysis responsibilities?

TIP: Keep electronic documents relating to data processing on the project in an easily accessible folder where data processing occurs.

QUESTIONS YOU SHOULD ASK ABOUT THE DATA DELIVERY

- Is there any information regarding the data delivery in the proposal / contract / grant application – or the RFP?
- Is there PHI/PII in the data delivery? How is it being protected?
- Will you be creating restricted access files (RAF) and/or public use files (PUF)? If so, what is their purpose and how analyzable can/should they be? What are the limitations of each file? Does the client or anyone else need to replicate earlier analysis results?
- In the PUF, what is the risk that a study participant could be identified by a member of the public or by someone who knows the participant?
- Who are the potential data users?
- Who is at risk of being identified in the data delivery? (E.g., Individuals, agencies, companies)
- In what format will the data be delivered? SAS, Stata, delimited, MS Excel, MS Access, XML, relational data bases?
- What versions of software are required to be used?
- What platform will the data be coming from, processed on by your company, and be used on by the recipient?
- How is the data expected to be delivered? SFTP? Encrypted drives (if so, what encryption software?) Another transfer method?
- Will code / programs be delivered to the client? If so, in which language(s)?
- Will associated files (format libraries, macro libraries) be delivered to the client? If so, in what form?
- Will documentation be delivered to the client? If so, in what format?
- What naming conventions should be used for files in the data delivery?
- What naming conventions should be used for data elements in the data delivery?
- How should data elements with missing values be coded in the data delivery? If from a survey, should they be coded to distinguish between different non-responses, such as don't know, refused, or logical skip?

TIP: Keep any emails / memos / specs regarding the data delivery in an easily accessible folder where data processing occurs.

BEST PRACTICES WHEN PREPARING A RESTRICTED ACCESS FILE AND/OR PUBLIC USE FILE

- If producing restricted access files and/or public use files, consider the following:
  - Forming a team to evaluate directly and indirectly identifiable information (e.g., demographic information such as age ethnicity, education, or occupation.)
  - The risk that a study participant could be identified by a member of the public or by someone who knows the participant (either within the data deliverable or if linked to an external data source)
  - What information should be entirely removed from the data and what are the consequences to its analyzability

- What information should be recoded so it less specific and what the consequenes to its analyzability
- Stripping out any of the 18 HIPAA identifiers[1]
- Indirectly identifiable information (IDI) becomes more identifiable in combination with other IDI. Specify crosstabs to determine if indirect identifiers lead to identity disclosure.
- Consider recoding data elements (top or bottom coding, collapsing, or truncating) to eliminate or reduce potential for identity disclosure.
- Review any open-ended responses and potential recode into new or existing collapsed categories
- Strip out old IDs and make new IDs

PLAN FOR THE END OF YOUR PROJECT

Think about your project's close-out (and data delivery) BEFORE you think about its start-up. Looking at the products that you need to deliver first will enable you to build a data management structure to help ensure success.

- What are the desired outcomes of your project? Will there be a data delivery or a series of data deliveries? Review the RFP for any language suggesting that data files are deliverables to the client. Often the language is broad and does not address risk of identity disclosure and de-identification.
- At the conclusion of your project, will your data need to be destroyed? Delivered? Kept? If kept, for how long, in what form, and where? Will back-ups including your data need to be destroyed? In what time frame?
- Think about the cycle of deliverables. Will your project deliver data on a daily / weekly / monthly / quarterly / yearly basis? Or will it be a one-time delivery? Will there be interim and final deliveries? What are the exact dates or date ranges associated with each data delivery?
- Does your company or client have any official close-out practices or documents that need to be completed?
- Does your company or client have any quality assurance practices for deliverables that need to be planned for?

Who, What, Where, How, When are all important items to know at the outset. Answering these questions will help you get started, inform your data management plan, and help ensure success with your data deliverable.

It is also important to consider HOW you will deliver your data. Your client may have specific requirements in terms of:

- File formats (SAS data set [what version? 32/64 bit? What platform? Xport/cport/native?], "flat" file, delimited file [space? Tab? Comma? Pipe?], MS Excel (compressed? w/macros?], MS Access (compressed?) XML [with a map or schema?], relational data base, etc.)
- Encryption (no, yes, if yes, what program / level)
- Transfer method (SFTP? External drive?)

[1] http://cphs.berkeley.edu/hipaa/hipaa18.html

GETTING STARTED

If there is not a data manager assigned to your project, and there is not an existing data management plan, that is the first place to start. Every project involving data processing and/or data deliveries, large or small, will benefit from a comprehensive data management plan. The DMP should cover guidelines and standards for:

- Storage practices and folder structures. There may be multiple platforms and multiple time periods (as well as multiple users) on your project.
- File and program naming conventions (see Data Storage Considerations)
- Documentation procedures
- Communication within the project team
- Input / Output cataloging
- Processing logging
- Peer review / quality assurance
- The DMP should also include references to:
- Data security plan (DSP) if relevant
- Data usage agreement(s) (DUAs) if relevant
- And incorporate:
- Analysis Plan (AP)
- Schedule of deliverables
- Delivery method
- Plan for project close-out, including data retention and destruction

If a DSP is relevant but not written, the data manager should ensure one is provided as a companion to the data management plan. In addition, the data manager should ensure that DUA(s) are properly executed and updated in a timely manner.

DATA STORAGE CONSIDERATIONS

It is vital to store files in an organized way. Keep all programs, logs and output, source data and final data used to create deliverables in separate folders. Data folders containing PHI/PII should be clearly labeled as such. Have a clearly-defined plan for naming datasets, programs and variables. Create a deliverable folder to hold final data sets, documentation, and programs (if applicable).

DOCUMENTATION

Documentation makes data file preparation more efficient and less costly. If documentation through the project cycle is weak, making the final data deliverables will be difficult, slow and expensive. Following the documentation procedures below allows for replication of results, if necessary.

Document processes with a process log: at a minimum, include process / program name, user, date and any relevant notes. Inputs and outputs with number of observations are also helpful. Maintain a catalog of incoming and outgoing data files: at a minimum, include filename, user, to/from locations, and transfer method. Use SAS® to create data dictionaries for original and analytic files, write auxiliary files such as format assignment code, make entries into a process log, and put documentation within program code.

USE SAS® TO SELF-DOCUMENT

Use system macros and functions to document your logs, lists, output and SAS output:

SYSFUNC(GETOPTION (SYSIN)) returns the path and name of the program; &SASDATE returns the date the program began; &SYSTIME returns the time the program began and &SYSUSERID returns the user ID of the programmer who submitted the job. These are available to all SAS users, and can be used in titles, footnotes, label statements, description statements, created variables and even a stored macro to populate program headers (see Paper 8300-2016, Glass and Hadden).

Build a process log using SAS, using the %WINDOW and %DISPLAY commands to solicit input from users. If the routine is included in programs, information from each run of each program will be collected including the information described above and more. (see Paper 8300-2016, Glass and Hadden). The program outputs information into an Excel workbook which is read in and exported iteratively so that any additional information entered into the workbook is retained.

If you receive data sets that do not have data set or variable labels, etc., use PROC DATASETS commands to modify the data set. This is far more efficient than saving a new copy of the data set (or [gasp] overwriting your data set).

Similarly, if you have unlabeled macros, graphics catalogs or format catalogs, you can use PROC CATALOG to “describe” them after the fact. (You can use the DES option when creating macro and graphics catalogs, but must use PROC CATALOG to modify format catalog descriptions.)

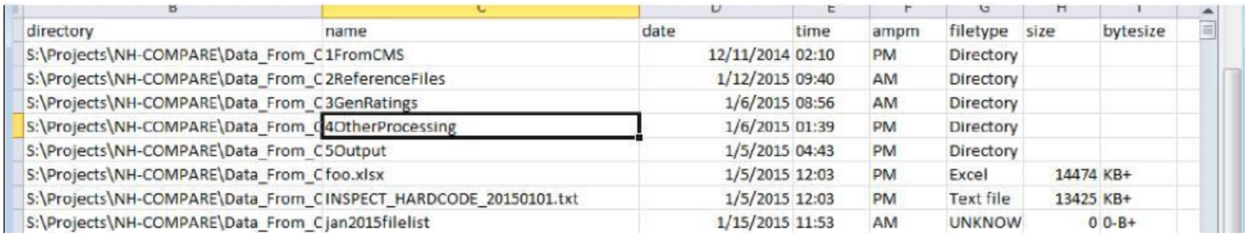
If you need to deliver formats specific to a project or a portion of a project, save your formats with a two level catalog name. For example:

```
PROC FORMAT LIBRARY = LIBRARY.Compendium2011Res;
        VALUE YESNODK 1 = "Yes" 2 = "No" 8 = "Don't Know";
RUN;
```

Using two level catalog names makes it far easier to identify the piece of a project a format is applicable to.

USE SAS® TO MANAGE DIRECTORIES

Create a text directory listing of a project directory starting from the top level from a command prompt or through the X command in SAS including subdirectories (i.e. dir *.* /s > dirlist.txt). Then use the resulting text file as input to a SAS program (readdirlist.sas, available from the author) which uses SAS functions to parse each line in the directory listing, converting the information into useful variables, and exports the information into an Excel spreadsheet. This spreadsheet (or the originating SAS data set) can be used to locate duplicate file names, large files, etc.

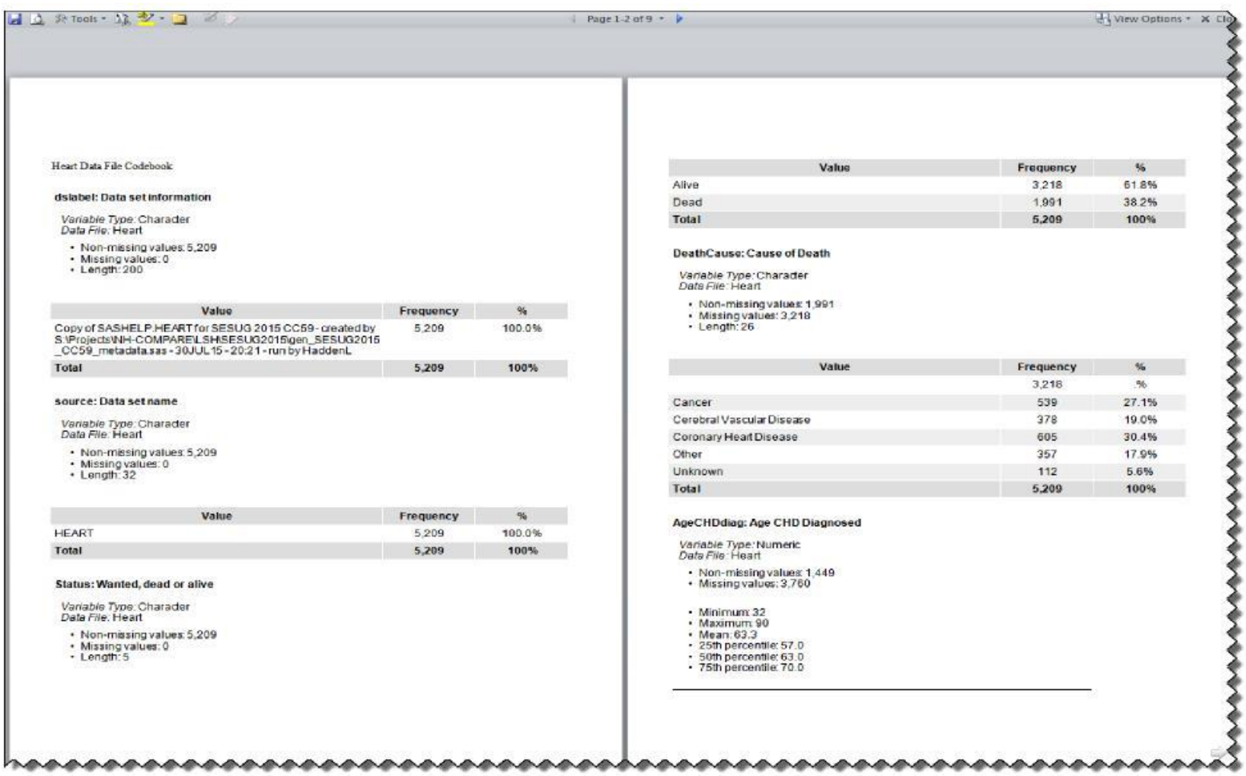


directory	name	date	time	ampm	filetype	size	bytesize
S:\Projects\NH-COMPARE\Data_From_C	1FromCMS	12/11/2014	02:10	PM	Directory		
S:\Projects\NH-COMPARE\Data_From_C	2ReferenceFiles	1/12/2015	09:40	AM	Directory		
S:\Projects\NH-COMPARE\Data_From_C	3GenRatings	1/6/2015	08:56	AM	Directory		
S:\Projects\NH-COMPARE\Data_From_C	4OtherProcessing	1/6/2015	01:39	PM	Directory		
S:\Projects\NH-COMPARE\Data_From_C	5Output	1/5/2015	04:43	PM	Directory		
S:\Projects\NH-COMPARE\Data_From_C	foo.xlsx	1/5/2015	12:03	PM	Excel	14474	KB+
S:\Projects\NH-COMPARE\Data_From_C	INSPECT_HARDCODE_20150101.txt	1/5/2015	12:03	PM	Text file	13425	KB+
S:\Projects\NH-COMPARE\Data_From_C	jan2015filelist	1/15/2015	11:53	AM	UNKNOW	0	0-B+

USE SAS® TO PRODUCE WRITE CODE AND PRODUCE CODEBOOKS

Using all the tips described in this paper (and more), you are ready to document your deliverables. It is possible to produce customized codebooks for SAS data sets with very little user intervention.

- Use PROC DATASETS, PROC CONTENTS, or dictionary tables, etc. to produce a documentation spreadsheet
- Review the spreadsheet and perhaps modify a missing label or format assignment. In addition, you may wish to categorize your variables beyond numeric and character.
- Import the modified spreadsheet, and use the information to write code to be included to generate a codebook with output varying by variable type; write code to generate a label statement; and write code to generate a format assignment statement, among other normally onerous tasks.



Heart Data File Codebook

dslabel: Data set information

Variable Type: Character
Data File: Heart

- Non-missing values: 5,209
- Missing values: 0
- Length: 200

Value	Frequency	%
Copy of SASHELP.HEART for SESUG 2015 CC59 - created by S:\Projects\NH-COMPARE\LSH\SESUG2015\gen_SESUG2015_CC59_metadata.sas - 30JUL15 - 20:21 - run by HaddenL	5,209	100.0%
Total	**5,209**	**100%**

source: Data set name

Variable Type: Character
Data File: Heart

- Non-missing values: 5,209
- Missing values: 0
- Length: 32

Value	Frequency	%
HEART	5,209	100.0%
Total	**5,209**	**100%**

Status: Wanted, dead or alive

Variable Type: Character
Data File: Heart

- Non-missing values: 5,209
- Missing values: 0
- Length: 5

Value	Frequency	%
Alive	3,218	61.8%
Dead	1,991	38.2%
Total	**5,209**	**100%**

DeathCause: Cause of Death

Variable Type: Character
Data File: Heart

- Non-missing values: 1,991
- Missing values: 3,218
- Length: 26

Value	Frequency	%
	3,218	.%
Cancer	539	27.1%
Cerebral Vascular Disease	378	19.0%
Coronary Heart Disease	605	30.4%
Other	357	17.9%
Unknown	112	5.6%
Total	**5,209**	**100%**

AgeCHDdiag: Age CHD Diagnosed

Variable Type: Numeric
Data File: Heart

- Non-missing values: 1,449
- Missing values: 3,760

- Minimum: 32
- Maximum: 90
- Mean: 63.3
- 25th percentile: 57.0
- 50th percentile: 63.0
- 75th percentile: 70.0

CONCLUSION

Preparing for a data delivery is a complicated endeavor. By going back to the future, and with the help of SAS tools, you can plan for a successful transfer of data.

Full code for SAS tips described on this page available from the authors upon request.

REFERENCES

Fraeman, Kathy Hardis, 2008. “Get into the Groove with %SYSFUNC: Generalizing SAS® Macros with Conditionally Executed Code.” Proceedings of NESUG 2008.

Glass, Roberta and Hadden, Louise, 2015. “Document and Enhance Your SAS® Code, Data Sets, and Catalogs with SAS Functions, Macros, and SAS Metadata.” Proceedings of SESUG 2015.

Hadden, Louise, 2014. “Build your Metadata with PROC CONTENTS and ODS OUTPUT”, Proceedings of SAS Global Forum 2014.

Kuligowski, Andrew T. and Shankar, Charu, 2013. “Know Thy Data: Techniques for Data Exploration.” Proceedings of SAS Global Forum 2013.

Raithel, Michael A., 2011. “PROC DATASETS: the Swiss Army Knife of SAS® Procedures.” Proceedings of SAS Global Forum 2011.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the contributions of their colleagues Daniel Gubits, Ryan Kling, Elizabeth Axelrod, Andreas Maier, Christianna Williams and especially Roberta Glass.

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the authors at:

Tom McCall: Tom McCall@abtassoc.com

Louise Hadden: Louise Hadden@abtassoc.com